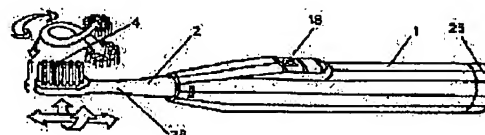


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Application no/date: 1992- 53050[1992/ 1/28]
 Date of request for examination: [1996/ 5/ 1]
 Accelerated examination ()
 Public disclosure no/date: 1993-199917 [Translate](#) [1993/ 8/10]
 Examined publication no/date (old law): []
 Registration no/date: 2804940 [Translate](#) [1998/ 7/24]
 Examined publication date (present law): [1998/ 9/30]
 PCT application no:
 PCT publication no/date: []
 Applicant: TERUUCHI HIDEO
 Inventor: TERUUCHI HIDEO
 IPC: A46B 13/02 A61C 17/22
 FI: A46B 7/06 A46B 13/02 A46B 13/02 ,700
 F-Term: 3B202AA07, AB09, AB13, AB15, AB26, BA02, BC07, BC09, BD04, BD06, BE10, CA05, CA06, CB05, DB01, EA01, EF10, BC05
 Expanded classification: 281, 282, 303
 Fixed keyword:
 Citation: [19, 1997.10.23,] (, ,)
 Title of invention: MOTOR-DRIVEN TOOTHBRUSH
 Abstract: PURPOSE: To execute reverse motion and truncated chevron motion, and to refreshingly brush the boundary line of teeth and the grum, between teeth, and the tooth surface by executing simultaneously the oscillating motion in the axial direction and around the axis, and changing its speed. CONSTITUTION: A turning speed ratio of a face gear 5 and a face gear 12 is set to 1:2, and the face gear 12 is placed side by side with a pinion 19 and supported axially by a supporting shaft together with an eccentric cam 13. By the simultaneous swinging motion by which the swinging motion is executed in the axial direction by the face gear 5, an eccentric cam 6, and a cam follower shaft 9a, and the swinging motion is executed around the axis by the face gear 12, the eccentric cam 13, and the cam follower shaft 9a, a brush part 4 of a toothbrush 2a executes truncated chevron motion through setting the pinion 19, the face gear 5, and the face gear 12 in a proper way. The number of times of swinging in the axial direction and the number of times of swinging around the axis can be changed, the tooth brush part 4 can execute circular motion, reverse motion, and truncated chevron motion at a high speed along a small distance, dental plaque which is scarcely removed is eliminated and teeth are brushed effectively. COPYRIGHT: (C)1993, JPO&Japio



TRANSLATION FROM JAPANESE

- (19) JAPANESE PATENT OFFICE (JP)
 (12) Patent Gazette (B2)
 (11) Patent No. **2804940**
 (24) Registration Date: July 24, 1998
 (45) Publication Date: September 30, 1998

 Identification

(51) <u>Int. Cl.</u> ⁷	<u>Symbol</u>	<u>F I</u>
A46B 13/02		A46B 13/02
A61C 17/22		700

 Number of Claims¹ (4 pages total [in original])

- (21) Patent Application No.: 4-53050
 (22) Filing Date: January 28, 1992
 (65) Unexamined Patent Application (Kokai) No.: 5-199917
 (43) Disclosure Date: August 10, 1993
 Examination Request Date: May 1, 1996
 (73) Assignee: 591235072 TERUUCHI Hideo
 (72) Inventor: TERUUCHI Hideo
 Examiner: TORII Minoru
 (58) Searched Fields (Int. Cl.⁶, DB Title)
 A46B 13/02
 A61C 17/22
 A61C 17/22
-

(54) [Title of the Invention] **Electrically powered toothbrush**

(57) [Claims]

[Claim 1] An electrically powered toothbrush comprising: a drive shaft provided on a first end thereof with a brush composed of a plurality of bristles implanted in a handle; a motor for driving this drive shaft; and a casing for housing this motor and said drive shaft,

 wherein said electrically powered toothbrush [further] comprises:

 a first face gear rotated by means of said motor and provided with an eccentric cam for causing said drive shaft to undergo reciprocating motion in the axial direction thereof;

 a second face gear arranged juxtaposed to this first face gear, and provided with an eccentric cam for causing said drive shaft to undergo reversing motion at a given angle about the axis thereof; and

 a cam follower arranged between this second face gear and said first face gear, undergoing three-dimensional rocking motion due to movement of the eccentric cam provided to the first face gear and movement of the eccentric cam provided to the second face gear, and transmitting this rocking motion to said drive shaft.

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JP 2804940

CLAIMS

(57) [Claim(s)]

[Claim 1] In the electric toothbrush equipped with casing which holds the driving shaft which formed the brush which comes to transplant hair on a shank in two or more hair in that end, the motor which drives this driving shaft, and this motor and said driving shaft While countering with the 1st contrate gear which prepared the eccentric cam which it rotates [eccentric cam] by said motor and makes those shaft orientations carry out both-way migration of said driving shaft, and this 1st contrate gear and arranging The 2nd contrate gear which prepared the eccentric cam to which the inversion transfer of said driving shaft is made to carry out in the direction of the circumference of the shaft at a fixed include angle, A motion of the eccentric cam which it was arranged between this 2nd contrate gear and said 1st contrate gear, and was prepared in the 1st contrate gear, The electric toothbrush which consists of a cam floor shaft which is rocked by three dimensions by motion of the eccentric cam prepared in said 2nd contrate gear, and transmits this rocking to said driving shaft.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the electric toothbrush which has improved the driving shaft furnished with a brush so that a brush may carry out three-dimensions movable [of migration of the shaft orientations, and the inversion transfer of the direction of the circumference of a shaft] by making coincidence drive.

[0002]

[Description of the Prior Art] conventionally, rotation of a motor is changed into rocking movement, and this is transmitted to a gear-tooth brush, the electric toothbrush which carries out a rocking drive is offered, and it is [come out and]. There was a thing which makes a gear-tooth brush rock in the thing which shaft orientations are made to rock, and the direction of the circumference of a shaft as such rocking movement, or a thing to which the circular motion of only an one direction is carried out, and these actuation is changeover switches, and was changed and used properly.

[0003]

[Problem(s) to be Solved by the Invention] The thing which makes a gear-tooth brush rock to shaft orientations had the fault of being hard to polish between a gear tooth and gear teeth. Moreover, although the thing which makes the shaft orientations rock a gear-tooth brush could polish between a tooth flank, a gear tooth, and gear teeth, it is not only hard to polish between the gear teeth and the gums on which a dental plaque tends to collect, but it had the problem of being easy to hurt one's gum. Furthermore, that to which the circular motion of the gear-tooth brush is carried out is rotation to an one direction, and effective polishing of it was not completed. This invention is made in order to cancel such fault, and while being able to polish effectively between the boundary line of a gear tooth and the gum, and gear teeth and gear teeth, it aims at offer of the electric toothbrush which does not hurt its gum, because a brush rocks to three dimensions.

[0004]

[Means for Solving the Problem] In order to solve the above-mentioned fault, this invention is considered as the following configurations. In the electric toothbrush equipped with casing which holds the driving shaft which formed the brush in the end, the motor which drives this driving shaft, and this motor and said driving shaft, while rotating by said motor, the 1st contrate gear which has the eccentric cam which makes those shaft orientations carry out both-way migration of said driving shaft was prepared. While countering with this 1st contrate gear and having arranged, the 2nd contrate gear which has the eccentric cam to which the inversion transfer of said driving shaft is made to carry out in the direction of the circumference of that shaft at a fixed include angle was prepared. The motion by this the 1st contrate gear and 2nd contrate gear was used as the electric toothbrush by transmitting to said driving shaft at coincidence.

[0005]

[Function] By arranging the 1st contrate gear and 2nd contrate gear face to face, rotation of a motor can be transmitted to each of these gears through a pinion at coincidence. Moreover, the brush which prepared the motion of the eccentric cam prepared in the 1st contrate gear and the motion of the eccentric cam prepared in the 2nd contrate gear in the end of a driving shaft by transmitting to a driving shaft at coincidence moves three dimensions.

[0006]

[Example] Hereafter, if the example of this invention is explained with reference to a drawing, it will set to Fig. 1-4. This equips with gear-tooth brush 2a the driving shaft 3 projected by the cylinder-like casing 1-like edge. Gear-tooth brush 2a brushes teeth carrying out reversal movement, and two or more come to transplant hair in the hair to which the brush section 4 was made as for this from nylon etc. at the end section of the pedicel 2 of the shape of a long picture formed by synthetic-resin material, such as plastics. Fitting of the attachment and detachment of gear-tooth brush 2a is made free at the tip of a driving shaft 3. Waterproofing rubber 17 is arranged in the upper limit section of casing 1 in the first half, a driving shaft 3 is attached in a feed hole, and he is trying not to be invaded into water in casing 1. In casing 1, a motor 20, a cell 21, and the drive section 24 are built in by the chassis 22 in the first half, and the lid 23 is arranged in the 1 round side face of casing for the switch 18 by the lower limit. The driving shaft 3 is supported to revolve by the bearing 16 prepared in casing 1, and a rocking drive is carried out by the drive section 24 in the first half. The drive drive section 24 is arranged between the 1st contrate gear 5 rotated by the motor 20, the 2nd contrate gear 7 which carried out opposite arrangement, and these contrate gears, and consists of a cam floor shaft 9 rocked by each contrate gear in the first half. The 1st contrate gear 5 and 2nd contrate gear 7 arranged the contrate-gear shaft 15 in each center of rotation, and by attaching the both ends in a chassis 22, they are in the condition in which each contrate gear carried out opposite arrangement, and they have set it up so that it may rotate. Such the drive section 24 is further explained to a detail.

[0008] As drawing 4 shows, the 1st contrate gear 5 had the gear which goes around the periphery of the disk side, shifted the core from the core of a disk, and provides the eccentric cam 6. The end of the contrate-gear shaft 15 is inserted in the location used as the center of rotation of the 1st contrate gear in the flat-surface section of an eccentric cam 6. Thus, the gear prepared in the periphery and the pinion 19 arranged in the revolving shaft of a motor 20 fit in, and the 1st formed contrate gear 5 is rotated. Like the 1st contrate gear 5, the 2nd contrate gear 7 shifted the core for the gear to the periphery from the core of a disk again, and has formed the eccentric cam 8 in it. In the flat-surface section of an eccentric cam 8, the other end side of the contrate-gear shaft 15 is inserted in the location used as the center of rotation of the 2nd contrate gear.

[0009] While arranging such the 1st contrate gear 5 and 2nd contrate gear 7 so that each gear section may counter, the gear prepared in the 2nd contrate gear 7 is rotated to coincidence by the pinion 19 arranged in the revolving shaft of a motor 20 as well as the 1st contrate gear 5. If the diameter of the 1st contrate gear 5 which carried out opposite arrangement, and the 2nd contrate gear 7 is the same, the contrate-gear shaft 15 is good in a straight line. However, in order to rotate each contrate gear by the same pinion 19 when one of diameters are changed as drawing 3 and drawing 4 showed, the contrate-gear shaft 15 will be bent and will be by making it a crank form. Thus, by changing the diameter of the 1st contrate gear and the 2nd contrate gear, or changing the number of gears, the rocking condition of a brush changes and it mentions later about this.

[0010] The cam floor shaft 9 mentioned above is explained with reference to a drawing. The perspective view in which drawing 5 shows a cam floor shaft, and drawing 6 are the explanatory views showing **** of the drive shown by drawing 3. When the 1st contrate gear 5 and 2nd contrate gear 7 rotate, it is contacted and rocked, it united with the edge of the driving shaft 3 mentioned above, and the eccentric cam prepared in each has established the cam floor shaft 9. The cam floor shaft provides the long hole 10 in the upper part of the frame of an ellipse, and this frame, as drawing 5 shows. The longitudinal direction and driving shaft 3 of a frame of an ellipse are arranged in the shape of T character towards intersecting perpendicularly mutually. Therefore, when the 1st contrate gear 5 arranged within the limit rotates, an eccentric cam 6 contacts the inside both-sides side of the shaft orientations of the driving shaft 3 which intersects perpendicularly with a longitudinal direction, without contacting the longitudinal direction of a frame, and makes the shaft orientations carry out both-way migration of the driving shaft 3.

[0011] The long hole 10 prepared in the upper part of the cam floor shaft 9 makes each opposed face the field where an eccentric cam contacts. The eccentric cam 8 prepared in the 2nd contrate gear 7 contacts, and this field makes the cam floor shaft 9 roll. A driving shaft 3 rotates at a fixed include angle, and the both-way migration of the brush section 4 is made to carry out in the direction of the circumference of a shaft by this motion.

[0012] Thus, according to the constituted drive section 24, a motor 20 rotates by actuation of a switch 18, and the pinion 19 arranged in the motor shaft as drawing 4 showed makes coincidence rotate the 1st contrate gear 5

and 2nd contrate gear 7. The eccentric cam 6 prepared in this 1st contrate gear and one contacts the internal surface within the cam floor shaft 9, and makes shaft orientations carry out both-way migration of the driving shaft 3 by rotation of the 1st contrate gear. The eccentric cam 8 prepared in the 2nd contrate gear contacts the field of the long hole 10 of the cam floor shaft 9, and makes the both-way migration of the driving shaft 3 carry out in the direction of the circumference of a shaft at a fixed include angle. The cam floor shaft 9 is rocked in the direction of three dimensions, and this motion is transmitted to the brush section 4 through a driving shaft 3 by such both motion.

[0013] In Fig. 7, it is the contrate gear which carries out rocking movement at the circumference of the contrate gear which is what was moved and shown and shaft orientations is made to carry out rocking movement, and the eccentric cam and shaft of the brush section 4 of gear-tooth brush 2a of this invention, and a thing showing the rotation velocity ratio of an eccentric cam, and left is shaft orientations and the right is a circumference of a shaft. About notation ****<-->, it is **** at the shaft-orientations maximum rocking time, and <--> shows the time of the circumference of shaft maximum rocking.

[0014] In Fig. 8, if a motion [the above-mentioned rotation velocity ratio] of 1:1.5 is explained further, if the brush section 4 is put into operation at the time of the notation <-** maximum rocking, a direction will change at the 2 -> time for 3 minutes, a centrifugal force and an interval will move circularly to <- time at the ** time, the count of shaft-orientations rocking will be set to 1.5 to 1 at the **-> time, and the count of circumference rocking of a shaft will be repeated on this orbit.

[0015] In Fig. 9, it is what showed the orbit of the above-mentioned rocking reversal movement to the gear tooth, and between a gear tooth, the boundary line of the gum and a gear tooth, and gear teeth will both be polished effectively.

[Effect of the Invention] As explained above, according to this invention, the following effectiveness was able to be acquired by having given **** of both shaft orientations and the direction of the circumference of a shaft at coincidence to the driving shaft to which it carries out movable [of the brush]. Namely, their teeth can be effectively brushed now by carrying out rocking migration covering three dimensions, reversing a brush. By changing the rotational speed of a contrate gear, the movement magnitude of an eccentric cam, etc., since the drive of this invention which makes a brush rock can change a rocking locus, it can choose the suitable movement toward toothbrushing according to the purpose. The effectiveness of being able to brush one's teeth now easily was able to be acquired without caring about the sense and include angle of the brush which hits against a gear tooth, since a switch did not need to be changed and three dimensions were moved to each motion of a brush like the conventional example.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the appearance perspective view showing the electric toothbrush of this invention.

[Drawing 2] It is the explanatory view showing the important section cross section of drawing 1 .

[Drawing 3] It is the perspective view showing a drive.

[Drawing 4] It is the decomposition perspective view of drawing 3 .

[Drawing 5] It is the perspective view showing a cam floor shaft.

[Drawing 6] It is the explanatory view showing the cross section of the drive shown by drawing 3 .

[Drawing 7] It is the explanatory view showing the locus of rocking migration of a brush, and the sense of a brush.

[Drawing 8] It is the explanatory view showing the locus of other same examples, and the sense of a brush.

[Drawing 9] The gear-tooth brush orbital Fig. shown in a gear tooth same as the above

[Description of Notations]

1 Casing

2 Pedicel

2a Gear-tooth brush

3 Driving Shaft

4 Brush Section

5 1st Contrate Gear

6 Eccentric Cam

7 2nd Contrate Gear

8 Eccentric Cam

9 Cam Floor Shaft

10 Long Hole

15 Contrate-Gear Shaft

16 Bearing

17 Waterproofing Rubber

18 Switch

19 Pinion

19a Output shaft

20 Motor

21 Cell

22 Chassis

23 Lid

24 Drive Section

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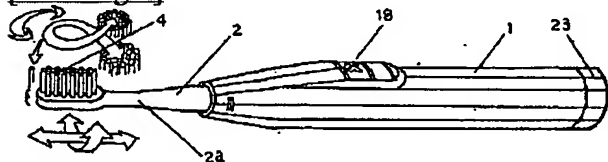
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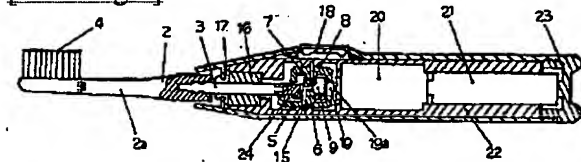
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DRAWINGS

[Drawing 1]



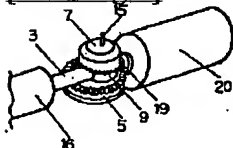
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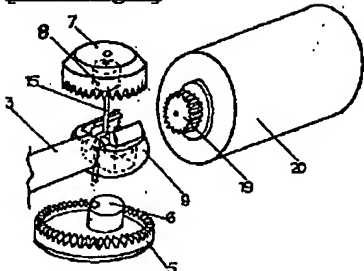
[Drawing 9]



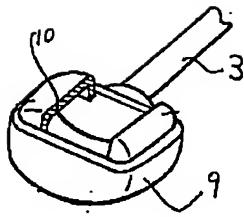
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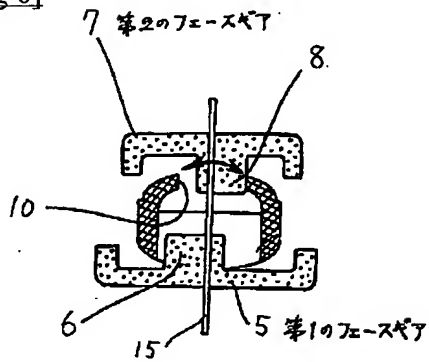
[Drawing 4]



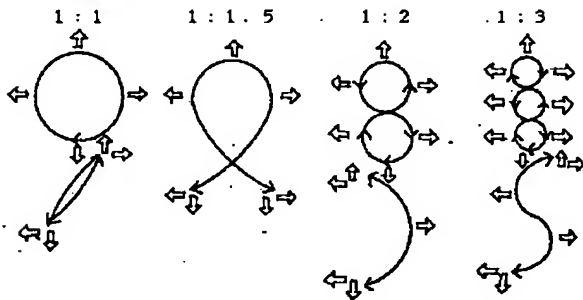
[Drawing 5]



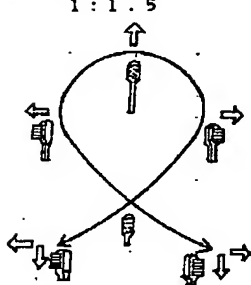
[Drawing 6]



[Drawing 7]



[Drawing 8]



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